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Agricultural Economics RESEARCH

CONTENTS FOR APRIL 1954 — Vol. VI, No. 2

		Page
Supply-Utilization of Agricultural Food Products	*Marguerite C. Burk and Martin J. Gerra*	33
Condensed vs. Detailed Schedule in Expenditure Surveys	*Barbara B. Reagan*	41
Procedure for Adjusting 1940 Census Data for College Students To Be Comparable With 1950 Data	*Burton L. French*	54

UNITED STATES DEPARTMENT OF AGRICULTURE • Agricultural Marketing Service

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AGRICULTURAL ECONOMICS RESEARCH

A Journal of Economic and Statistical Research in the
Agricultural Marketing Service and Cooperating Agencies

Volume VI APRIL 1954 Number 2

Supply-Utilization of Agricultural Food Products

By Marguerite C. Burk and Martin J. Gerra

In Consumption of Food in the United States, 1909-52,[1] *there is presented for the first time an "index of supply-utilization" of farm products having food use. This new index breaks down the combined utilization of such products, on a farm-value basis, both according to sources of supply and according to use and disposition. The breakdown is given for each year and in terms of time series relative to the base period 1947-49. Current data of the index are now published at regular intervals in* The National Food Situation.[2] *This article is a preliminary report by the authors of the new index. It explores some of the uses of the index, suggests further problems to which it may apply, and presents comparative trends among commodity components that were developed in its preparation. Research is continuing toward preparation of a bulletin developing these subjects and extending the index to include nonfood farm products.*

FOR MANY YEARS agricultural economists have tried to appraise changes in American agriculture. These changes are the net results of complex economic and physical factors which affect the output of our many farm products. Economists realize that only through careful study of past changes can they understand the relative significance of the forces that brought them about and that only with such understanding can they do a reasonably good job of forecasting future changes.

Although supply, utilization, and demand for major commodities have been studied at length, there has been no really satisfactory tool to analyze what has happened to all farm products as a coordinated whole. The new supply-utilization index provides such a tool in the case of products that can be used for food. And within the coming year we hope to complete the development of an essential attachment, the subindex of supply-utilization of farm products having only nonfood uses.

Just what is the new index? How does it work? What is it good for? We can answer the first two questions rather easily. But we have used the index for such a short time that our answer to the last question is based upon rather limited experience and knowledge.

[1] UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. CONSUMPTION OF FOOD IN THE UNITED STATES, 1909-52. U. S. Dept. Agr., Agr. Handbook 62, September 1953, pp. 2-28.

[2] UNITED STATES AGRICULTURAL MARKETING SERVICE. THE NATIONAL FOOD SITUATION. Quarterly. Washington, D. C. (Processed.)

What the New Index Is

The supply-utilization index measures the annual flow of agricultural products from our farms and into the United States from foreign countries, in and out of stocks—to our consumers, our Armed Forces, our Territories, and foreign countries. For all agricultural commodities that have food use it combines data on the basis of farm values, using 1947-49 farm prices for all years. In this way the index provides a measure of changes in quantity in economic terms rather than on the basis of avoirdupois or physical weight. It reflects changes in supply and utilization both of commodities, like potatoes, that are bought by consumers mainly in the raw form in which they are trucked from the farms and of commodities, like soybeans, which reach consumers chiefly in a variety of processed forms. Details of construction of the index are given in the bulletin on food consumption.[3]

The index has two parts. The first part describes the proportions of the total farm value of all farm products (having food uses) utilized in a given year, say 1952, coming from our own farms, from foreign countries, or out of stocks; and going into stocks, into civilian use or export, or bought by military agencies or the United States Department of Agriculture. Several of these categories were subdivided into food and nonfood use. All of these proportions were derived by comparing the total of the values for every commodity falling into that category with the total value of the quantities of all farm products (having food uses) used in that year. The second part of the index is based on the same data but relates the value aggregate in each category for each year to the average value of all farm food products used in the base period, 1947-49. From these relationships, or from the values for the individual components, we are working out subindexes.

The index accounts for all agricultural crops, livestock, and livestock products which have some food use. These cover approximately 87 percent of the annual 1947-49 farm value of agricultural commodities. Cotton, tobacco, shorn wool, hay, and field seeds have no human food use and are excluded, together with forest products (except maple sugar and sirup), greenhouse and nursery items, fishery products, and spices. Included, however, are major agricultural products not produced domestically but used for food in this country, such as bananas and coffee.

How It Works

Superficially, this index works like any other index that is computed by multiplying base-period prices by changing quantities to get values for each year, which are then divided by average values for the base period. But this index is somewhat unusual in that it also reflects the flow of joint products and byproducts. In constructing the index our main problem was how to give proper weight to processed commodities, such as wheat flour moving into domestic distribution channels. The total farm value of wheat milled for domestic food should not be charged to the food account because another product of the milling operation is millfeeds which in turn move back to farms for livestock feeding. We had to make allowances also for imports and changes in stocks of the processed products.

The key to our puzzle was the idea of allocating the total farm value of the wheat milled according to the ratio of the wholesale or primary market value of each joint- or by-product to the total wholesale value of commodities processed from the wheat. So for 1952 we allocated to the nonfood category $190 million worth of the wheat that was milled, 17 percent by value. This was done instead of putting the full farm value of wheat milled for domestic food in the civilian food column or using the poundage milling ratio of 72 pounds of flour and 28 pounds of bran and other millfeeds from 100 pounds of wheat.

We used this key to allocate our value data to categories on the supply as well as the utilization side of our index. Thus, we were able to incorporate in the index information on imports of products—oils, for example—without pretending that we also imported the oilseed meal and cake or the whole oilseed equivalent of the oils. This means that the index does not overemphasize the economic significance of imports of oils compared with the domestic output of oilseeds.

[3] Op. cit.

Shows Trends in Supply and Utilization

From 1924 to 1953 total utilization of agricultural food products for food and nonfood purposes increased 40 percent. During these three decades the economy went through two major fluctuations in agricultural activity. As table 1 shows, total utilization gradually increased until the depression period of the 1930's, then fell off for several years. It had climbed back to its former level by 1938, and it continued to advance steadily as World War II brought heavy demands upon agriculture. A peak of utilization of agricultural food products was reached in 1944. With the termination of hostilities the index of total utilization began a decline which was reversed in 1949. By 1953 the level of the index had climbed above that of 1944.

Over this 30-year period the internal composition of total utilization was changing. Crops became a smaller percentage of the total value of agricultural commodities used and livestock and livestock products[4] and imported commodities not produced in this country assumed

[4] On a gross basis, because the value of livestock products used in a particular year includes that portion added by feeding crops which are counted separately.

TABLE 1.—*Supply-utilization of agricultural food products: Major subindexes, 1924-53* [1]
(1947-49 = 100)

Year	Total utilization	Production	Imports	Commercial and USDA exports and shipments	Domestic utilization [2]			
					Food			Nonfood
					Total [3]	Crops [4]	Livestock	
1924	74.7	73.2	75.5	85.7	70.5	72.1	70.6	83.9
1925	76.7	74.0	81.4	65.8	71.2	76.9	69.9	92.8
1926	76.1	74.5	87.9	63.9	72.6	78.2	71.0	87.4
1927	77.1	75.0	85.1	73.0	72.1	74.8	71.5	90.6
1928	77.7	76.8	85.3	63.1	72.7	77.8	71.2	93.0
1929	77.9	74.7	94.9	62.3	74.1	80.3	71.9	90.7
1930	76.5	74.1	85.9	49.3	74.2	79.7	72.5	87.5
1931	76.8	77.3	79.5	43.9	74.7	79.3	73.3	88.0
1932	77.2	77.8	71.1	37.1	73.7	75.7	73.4	93.4
1933	76.9	72.6	76.5	28.4	74.3	74.5	74.8	92.1
1934	74.5	68.2	75.6	27.2	75.8	75.2	76.7	78.8
1935	70.8	71.6	96.6	21.0	73.0	81.0	69.1	75.0
1936	75.4	68.1	96.9	19.6	76.0	78.2	74.5	85.4
1937	75.1	77.8	104.9	27.2	77.3	84.1	74.4	78.5
1938	78.3	78.4	86.9	54.1	76.8	80.1	74.9	86.6
1939	81.2	79.4	92.3	41.9	80.4	83.5	78.7	90.7
1940	83.3	83.2	92.3	30.1	83.4	84.3	82.8	92.8
1941	87.7	87.6	104.6	48.1	86.1	89.1	84.7	98.2
1942	95.1	96.6	66.6	74.0	89.6	92.0	90.2	109.3
1943	104.4	99.0	91.1	113.6	94.0	92.0	97.2	127.3
1944	105.6	103.0	110.8	113.0	101.4	99.3	103.8	116.0
1945	103.4	100.7	92.3	101.8	101.5	102.6	102.0	111.8
1946	102.1	101.8	89.3	119.9	99.7	98.5	100.4	107.6
1947	101.7	98.1	93.8	115.5	100.9	100.3	101.8	101.7
1948	97.4	102.4	101.6	88.9	99.0	99.8	98.5	96.2
1949	100.9	99.5	104.6	95.6	100.1	99.9	99.8	102.1
1950	101.4	100.5	107.3	96.7	100.4	94.0	102.8	105.1
1951	104.3	99.1	110.5	137.8	102.6	97.0	104.8	105.7
1952 [5]	104.2	104.0	110.9	121.6	104.9	96.2	108.5	100.7
1953 [5]	106.6	105.9	113.6	106.2	108.0	97.0	112.6	100.4

[1] Data in each category are expressed as ratios of their 1947-49 averages, rather than as ratios of 1947-49 total utilization as published in table 2 of Agriculture Handbook 62, "Consumption of Food in the United States, 1909-52," p. 5.

[2] Includes military as well as civilian utilization.

[3] Includes coffee, tea, bananas, and other commodities not produced domestically, as well as crops and livestock.

[4] Excludes items not produced domestically.

[5] Preliminary.

greater importance. This change reflected a shift in utilization from lower cost crop products to higher cost livestock products and imported foods.

At the same time, changes were taking place in the relationships of production, imports, food use, and the other supply and disappearance categories to total utilization. The overall index and the subindexes measure these changes satisfactorily.

PRODUCTION. – Domestic production [5] usually supplies 90 to 95 percent of the annual total utilization of agricultural food commodities. The low contribution of production in 1934 and 1936 reflects the effect of drought on current farm production and the reliance on past production. As a result of the cutback during the midthirties, production of agricultural food commodities for food and nonfood use in 1939 was only 8 percent higher than in 1924. Meanwhile, our population had increased 15 percent. With the threat of impending war a reality in Europe, then in the Pacific, our farmers expanded their output in each of the 5 succeeding years. A poor corn crop in 1947 pulled per capita production down noticeably, although it was still higher than in any previous year except those of the full mobilization period. Since 1947 per capita production has continued slightly below the wartime peaks attained in 1942-46; large outputs of agricultural food products have been offset by the postwar acceleration in the rate of population growth.

Production of crops that have food uses shows greater fluctuations than that of livestock and livestock products, especially in the years before World War II. Because of wartime demands and sudden postwar adjustments in Government takings and price controls, production of livestock and livestock products varied much more during the 1940's than in the previous two decades. Generally, the ups and downs in crop production preceded turns in livestock and livestock products by about 1 to 2 years.

FOREIGN TRADE.—Except for 1945 to 1947 (and then only because of military-civilian feeding) this country imported more agricultural food products than it exported. The import balance grew larger from 1924 to 1937, then declined slightly. Even with the wartime expansion in exports under the lend-lease program and the contraction of imports because of enemy operations and use of commercial ships to carry military materiel, this country was a net importer until 1945. When exports under the military-civilian feeding program were added to those handled through commercial channels and to deliveries by the United States Department of Agriculture for United Nations Relief and Rehabilitation Administration and other relief and economic assistance programs, we found that in 1945-47 more farm products that had food uses were exported than imported. Also, in many countries agricultural production was in a chaotic state at the end of the war, a condition that shifted trade out of normal patterns for several years.

During the last 30 years imports have supplied 5 to 10 percent of the total quantity of farm food products used in this country each year. They were most important in 1935-37, years in which domestic production was relatively low. Submarine attacks and other war developments in 1942 reduced imports to the lowest rate since World War I, but in the next 2 years they recovered to a considerable extent. Then in 1945-47 this country imported less because of the disruption in world markets mentioned earlier.

Imports in relation to annual utilization are no more important now than they were 30 years ago, but their volume has increased greatly. The principal cause of this increase is the rise in our demand for commodities not produced in

[5] Our concept of farm production includes production of crops for use as seed and feed counted in the year they are harvested. Our figures include feed crops for all classes of livestock but exclude hay and pasture. Some duplication arises because the quantity used for seed in a given year turns up again as a part of production in the following year. Similarly, production of feed is later recounted in the form of milk, eggs, and live animals marketed (where production of livestock is considered to be the live weight of animals slaughtered in each year). But no adjustments were made for these duplications because the purpose of the index is to provide a measure of the flow of goods produced by agriculture to the agricultural system itself (internal transfers) and outside the agricultural system (external transfers) in terms of the quantities used each year. It is an index of total utilization, not net output. See Agriculture Handbook No. 62 [op. cit.] for further details.

this country—such items as coffee, tea, cocoa beans, and, to a lesser extent, bananas and certain tree nuts and oils.

From 1924 to the late 1930's our exports had a definite downtrend, dropping to less than 2 percent of our annual flow of farm food products in the midthirties. Much of the decline was in wheat, pork, and lard. The quantity of agricultural food products exported rallied sharply during World War II and the postwar period from prewar lows and surpassed previous highs. During the war years, three-fourths of our exports were shipped by the United States Department of Agriculture under various aid programs. In the last 2 years—1952 and 1953—most of our exports and shipments moved through commercial channels; only 10 percent of the total was handled by the Department, principally surplus-disposal.

STOCKS.—Information regarding food stocks is far from complete. We have no data on holdings of major foods (except sugar) by retail stores, and little information on stocks held by wholesalers or processors outside cold storage warehouses and some special types of grain storage facilities. But the situation is better than it looks at first glance, because the Department of Agriculture now gets reports on most of the storable commodities whose stocks can change significantly from year to year. Coverage has improved greatly during the period included in the index. These facts explain why we operated with changes in stocks rather than with actual stocks in the computation of the index. In most years the changes amount to less than 3 percent of the flow of farm food products. Big swings in stocks occurred in 1934-37 and in 1948. The index data disclose unusually large annual accumulations of stocks in 1937 and 1948. The earlier year preceded a recession in the whole economy and the last quarter of 1948 marked the beginning of the 1949 deflation.

DOMESTIC FOOD AND NONFOOD USES.—Domestic use of agricultural food products for food and nonfood purposes during the period covered by this index accounted for at least 94 percent of total annual utilization; in 1936 such use reached a high of 99 percent. From 1924 until the end of World War II, about one-third of the commodities having any food use was used for nonfood purposes.[6] Since 1946 nonfood use has decreased about 10 percent, mainly because of a drop in the percentage of annual utilization going for feed. So between 1924 and 1953 nonfood use rose only 20 percent, but food use went up 50 percent.

During the period for which the index shows a gain of more than 50 percent in food use, the total population of continental United States expanded 40 percent. The net gain in per capita food use amounted to slightly more than 9 percent. When members of the Armed Forces are excluded from these figures, the net gain for the 30 years is fractionally lower because their takings average higher than the consumption rate of civilians.

As we look at trends in the food category of the supply-utilization index, a basic change in utilization patterns stands out. Crop products represent a smaller share—10 percent less in postwar than in prewar years—and livestock and livestock products a larger share of our food utilization. In the last 5 years per capita civilian food utilization of crops was at its lowest level in 30 years, with the exception of a period in the early thirties, but utilization of livestock and livestock products remained well above prewar levels, and only slightly below the peaks of 1944-47.

Most nonfood use of agricultural food products is for feed and seed, both for future output. Of the 31 percent of annual total utilization that went for nonfood purposes in 1924, feed accounted for almost 26 percent, seed for 2 percent, and the remaining 3 percent went for soap, drying oils, leather, and other minor items, and a small quantity for production of alcohol and alcoholic beverages. In 1952, slightly less than 27 percent went for all nonfood uses—more than 21 percent for feed, about 1½ percent for seed, 1 percent for alcohol and alcoholic beverages, and the remaining 3 percent for miscellaneous purposes. Although some of the data we used in working up these estimates were derived in a roundabout way, we think the estimates give reasonable approximations of rela-

[6] These include utilization for seed, feed, industrial alcohol, alcoholic beverages, leather, soap, drying oils, and other miscellaneous uses, as well as some waste and loss at the farm level.

tive magnitudes between uses and of trends in the various categories. During the period of the index they show that feed and seed took progressively smaller shares of annual utilization, that the share of alcohol and alcoholic beverages increased, and that other nonfood uses remained about the same.

Crop products, of course, contribute the largest share to nonfood uses as they are the chief sources of feed and seed. Since the period of World War II, the nonfood use of livestock and livestock products has declined to considerably lower rates, owing largely to a drop in the quantity of skim milk used for feed (and wasted) and a reduction in the use of pulled wool. At the same time, nonfood uses of crops are well above prewar rates so that they now make up four-fifths of total nonfood use of domestic products compared with three-fourths in 1924-42.

The index data on seed utilization show no appreciable change in the quantities used since 1924, but in 1947-51 crop production averaged more than 30 percent above the 1924-28 average. Improved seed and better production practices contributed to lowering the seed-production ratio. Over the period there was a great increase in the quantity of all fertilizer used per acre.

The tremendously increased use in agriculture of tractors, motortrucks, and automobiles brought about a great reduction in numbers of horses and mules on farms—more than 70 percent in 30 years. Replacement of horses and mules had several significant effects. It made available for food production some 60 million acres of cropland, including acreage of hay, formerly used for turning out feed for farm and nonfarm horses and mules. In 1924, a fifth of all grain and roughage-consuming animal units were horses and mules; in 1953 only 5 percent fell into this category. Feed thus diverted from producing power to producing food amounted to an estimated 20 million tons of grain and 21 million tons of hay and silage, or about 15 percent of all concentrates and 19 percent of all hay and silage fed in 1951-52.

These data partly explain the reduction in the ratio of feed utilization to production of livestock and livestock products indicated in the supply-utilization index. In addition, as the horse and mule population declined, more pasture and rangeland became available for feeding food-producing livestock.

Use of farm food products in alcohol and alcoholic beverages reflects a rise after the repeal of prohibition to a peak in the war years when the demand for industrial alcohol was heavy. Such use of farm food products then tapered off as petroleum products were substituted for grains and molasses as raw materials in production of ethyl alcohol.

Analyses Made with Supply-Utilization Index

Although the full potential of the new index for analytical purposes is not yet known, we can demonstrate its usefulness in the study of several rather complicated problems. We cannot assume that we have definitive answers to these problems, but in using this master index and its mass of subindexes we have made a start.

Here are several problems we have considered: What has been the effect of changes in the national economy on total domestic utilization of farm products? On domestic food use? How have changes in utilization affected the demand for farm resources? Do changes in food utilization measured at the farm level differ from changes in consumption measured at retail? How have changes in major commodities affected the total utilization of farm products during the last 30 years?

Study of the effects of changes in the national economy on the use of farm food products is complicated by technological changes. Because of the substitution of tractors for horses and mules, requiring petroleum products instead of feed, we must adjust the utilization figures to draw a reasonable conclusion about economic effects. This raises the tilt of the utilization curve slightly but domestic utilization still increased only about a third as much as real income between 1924 and 1953. During the 1930's total supply-utilization was slow to adjust to the changes in national income but since 1935 it has followed the movements in income closely.

On a per capita basis, domestic use of farm products for food in 1924-52 was highly related to real income after taxes, but it showed no

relation to prices farmers received for food commodities.[7] As sidelight, changes in retail food prices are a factor in the changes in food consumption at retail along with disposable income. We plan to explore later the converse of this picture, that is, the effect of food supplies (as measured by our index) on prices received by farmers and on farm income.

Our discussion leads to the question, What has been the relationship of changes in domestic food utilization to the demand for farm resources? Before we discuss this question, we must emphasize that we are still in an exploratory stage. A glance at the index of per capita food utilization shows that food use has risen a little faster than population. So we need to find out whether the pattern of food use has changed and, if so, how those changes have affected the use of farm resources. To demonstrate our new tool, and still to be brief, we shall use only a two-way breakdown—food use of crops, and of livestock products—but will exclude those foods not produced in this country. The farm value of crops used for domestic food in 1953 (in 1947-49 prices) was $0.2 billion less than was expected on the basis of the increase in population from 1924 to 1953. But the value of livestock products in 1953 was $1.9 billion higher. This indicates that the greater emphasis by our consumers on livestock products called for $1.7 billion extra farm resources, 8 percent more.

Or we can put it another way. A shift in consumption involving a 10-pound reduction in per capita consumption of wheat flour and an increase of 10 pounds in per capita consumption of meat means an increase of $530 million (in 1947-49 prices) in the use of farm resources aside from changes in marketing services. This demonstrates the significance to our farmers of the make-up of the daily poundage of food that we eat.

Comparison of changes in food use, measured at the farm level on the one hand and at the retail level on the other, reveals the effect of some of the changes in marketing patterns on the index of per capita consumption of food. When we measure utilization at the farm level, we work with raw farm products and the equivalents of processed products and combine them by means of farm prices. But for the index of per capita food consumption we use retail weights of fresh and processed commodities and retail prices which include marketing costs. Because of the great increase in consumption of processed foods, which require substantial amounts of marketing services, we expected that food use measured at the farm would show much less change than when it was measured at retail. Between 1924 and 1953 the index of food utilization went up 9 percent while the index which evaluated food consumption at retail went up 12 percent.

The shift to processed forms of cereals, sugar, fruits, and vegetables gradually separates the subindexes for those food groups of the overall index of food consumption from the comparable subindexes of the farm-level index over the last three decades. Because cereal products, sugar, fruits, and vegetables currently make up less than a third of the total value aggregate of both indexes, the difference between the two indexes is less than we expected. Moreover, looking at detailed data, we found that for some fruits, such as oranges, and vegetables the relatively high cost of distributing the fresh item offsets the cost of processing and distributing the canned and frozen products. In such cases, a shift from fresh to processed food may actually reduce the retail value, though the farm value is not affected.

Turning to the question of how changes in major commodities have affected total utilization in the last 30 years, we note first that total utilization (food and nonfood) has just kept pace with the 40-percent rise in our population. Study of the figures in table 2 shows the broad shifts among commodities which occurred from the beginning to the end of the period covered with the index. We used averages of 1924 and 1925 and of 1952 and 1953 to reduce the effect on our comparison of unusual happenings to individual commodities in single years.

It appears (to us) that the increased use of poultry products has not been at the expense of any particular commodity group, except per-

[7] X_1 = index of per capita food utilization, X_2 = per capita disposable income (deflated), X_3 = farm prices for food (deflated), fitted 1924-52, $R^2 = 0.86$

$$\log X_1 = 1.49 + \underset{(\pm .05)}{0.31} \log X_2 - \underset{(\pm .06)}{0.06} \log X_3.$$

TABLE 2.—*Farm value of farm food products used in 1924-1925 and 1952-1953 in terms of 1947-49 average prices, by commodity group, with comparisons*

Commodity group	Total utilization [1]				
	Average for 1924 and 1925		Average for 1952 and 1953		1952-53 as a percentage of 1924-25
	Farm value	Percentage of total	Farm value	Percentage of total	
	Million dollars	*Percent*	*Million dollars*	*Percent*	*Percent*
Tree nuts	74	0.3	152	0.4	206
Poultry products	2,239	9.0	4,432	12.7	198
Oil crops	854	3.4	1,631	4.7	191
Coffee, tea, and cocoa	579	2.3	1,081	3.1	187
Dry beans and peas	105	.4	170	.5	162
Fruits, including bananas	810	3.2	1,222	3.5	151
Vegetables	1,273	5.1	1,858	5.3	146
Livestock products	6,696	26.7	9,298	26.7	139
Milk	3,968	15.8	4,958	14.2	125
Grain products	7,224	28.8	8,804	25.2	122
Sugars and sirups	590	2.4	690	2.0	117
Potatoes and sweetpotatoes	646	2.6	580	1.7	90
Total	25,058	100.0	34,876	100.0	139

[1] Includes domestic uses and exports and shipments for food and nonfood purposes.

haps some substitution of eggs for oatmeal. The livestock product group, including meats and pulled wool, held its relative position and the decline in consumption of milk was actually in butter, so increased use of poultry products didn't particularly affect that category. Poultry products contributed an extra $1,300 million (in 1947-49 prices) to the demand for farm resources over and above the 40-percent increase for all commodity groups.

One striking change in utilization was the 9-pound drop in per capita consumption of butter from 1924 to 1953. This is equivalent to a reduction of 28.5 billion pounds of whole milk, valued at $1.2 billion in terms of 1947-49 prices. About $500 million of this reduction in the use of farm resources for butter was offset by increased use for other dairy products, leaving a balance of $700 million. Because of the concurrent 6-pound increase in per capita consumption of margarine, we examined the offsetting effect of the rise in the use of farm resources for producing the ingredients of margarine, mainly cottonseed oil and soybean oil. The farm value equivalent, in 1947-49 prices, of the increased use of these oils in production of margarine was about $100 million. The remaining $600 million of farm resources was shifted to the production of other farm products.

Now for a few notes on the commodity groups whose utilization has lagged behind. The grain group held its own much better than we expected from the downtrends in feeding horses and mules, referred to earlier, and in per capita food use of cereal products. The former use required roughly $1 billion less of farm resources in the last 2 years than in 1924 and 1925. From 1924-25 to 1952-53 total domestic food use of grains went up only $75 million in terms of farm values; the reduction in per capita use meant more than a third of a billion dollars smaller demand for grains. The significant supporting element in the grain picture is the increased use of grains for feeding poultry and cattle. The total value of grain fed to livestock other than horses and mules rose about $1.8 billion from 1924-25 average to 1952-53 average, again in terms of 1947-49 farm prices.

Part of the failure of the sugar and sirup group to keep pace with population can be ascribed to maple, sugarcane, and sorgo sirups, but use of refined cane and beet sugar is also less per capita than in the midtwenties.

The downtrend in per capita consumption of

potatoes and sweetpotatoes reduced the farm value of all agricultural products having food use by a quarter of a billion dollars during the 30 years.

In conclusion, we say again that our preliminary study of these commodity shifts, as well as the other questions we posed, has merely skimmed the surface of the problems.

There are other important questions, too, which we haven't tackled yet. One of the most intriguing is to evaluate the relationships between changes in utilization and farm prices, farm income, and the marketing bill for farm products. Furthermore, we have still to put those farm products which have no food uses, such as cotton, shorn wool, and tobacco, into our data, as well as our analyses. As soon as the index covers all agricultural commodities, we shall be able to construct an index of per capita utilization of farm food and nonfood products for use in matching the production potential of American agriculture with future "requirements" for farm products. Also, we shall be able to tailor special indexes for use in particular problems, such as utilization of only those products grown in this country or utilization excluding exports.

We must end this article with the favorite conclusion of economists and statisticians, "more work needs to be done on the subject." But we continue work on a bulletin which we hope will cover more adequately these areas opened up in this article, as well as other aspects of the supply and use of farm products.

Condensed vs. Detailed Schedule in Expenditure Surveys

By Barbara B. Reagan

High costs of surveys have brought pressure for less expensive ways of getting data on family expenditures, and have raised interest in opportunities to get such data through limited supplementary schedules attached to other surveys. An experiment to test this approach was undertaken by the (former) Bureau of Agricultural Economics and the (former) Bureau of Human Nutrition and Home Economics in simultaneous surveys of farm-operator families in contiguous areas. One included a few summary questions on family spending, the other a more detailed breakdown of the major expenditure categories. This paper summarizes the comparison of data obtained from the two surveys, and discusses the implications regarding the feasibility of this approach for gathering data on family expenditures.[1]

A CONDENSED-SCHEDULE APPROACH to family expenditures, obviously, is suited only for studies that seek total family living expenditures alone, or at most the relative importance of broad categories of family spending. It would not yield data adequate for deriving expenditure weights for consumer price indexes or for analyzing market demand for specific consumer goods.

The type of condensed schedule considered in the study reported here is one in which esti-

[1] The separate surveys have been reported in THE GENERAL ENUMERATIVE SURVEYS, by EMERSON M. BROOKS and CATHERINE SENF, this Journal 1 (2):37-48; 1 (4): 105-128. April and October 1949; and FARM FAMILY SPENDING AND SAVING IN ILLINOIS, by JEAN L. PENNOCK, MARGARET L. BREW, and ROSE C. TILLINGHAST, U. S. Dept. Agr., Agr. Inform. Bull. 101 (in press). The experiment described here is also summarized in USE OF CONDENSED SCHEDULE TO CUT COSTS IN FAMILY EXPENDITURE SURVEYS, Journal of Home Economics, vol. 46, No. 3 (March 1954), by the present author. A complete report, including reproductions of the schedules used, is available on request from the author.

mates of major categories of family living expenditures such as food, clothing, and housefurnishings, are obtained, as well as total family living. If the total alone were desired, an alternative method would be to obtain data on family income and net changes in family assets and liabilities during the year, and derive family expenditures by subtraction. This may be suitable for families who are dependent chiefly on wage or salary income for whom such items are easily determined. But complexities of gross income and business expense make this method difficult with farm or other self-employed families.

Furthermore, the condensed schedule was expected to result in a relatively short interview on family expenditures. A condensed schedule means reduced costs only if quick answers to summary questions are acceptable, and if the respondent is willing to give such answers. Past experience has shown that if carefully built-up answers are wanted, it is both quicker and more accurate to provide space for the components on the survey forms rather than leave enumerator and respondent to attempt to itemize and add components in the margin of a schedule or on scratch paper.

The opportunity to study a shortcut method of obtaining family living expenditures and major categories of spending arose when, to meet different objectives, the (former) Bureau of Agricultural Economics and the (former) Bureau of Human Nutrition and Home Economics simultaneously surveyed two statewide samples of Illinois farm-operator families early in 1947.[2] To provide material for this study, both Bureaus included questions on annual family expenditures, and each used different schedule designs for these questions.

The two surveys here compared were conducted with different field staffs and with somewhat different field procedures. The Illinois survey that used the condensed schedule, hereafter referred to as survey A, was part of the nationwide January 1947 Survey of Agriculture, conducted by BAE. Its field procedures were determined by requirements of the national study. It was a multi-purpose survey of farm income, farm expenses, other family income, family expenditures, accidents, wages and employment of hired farm workers, and characteristics of all persons in the household. No data, however, were obtained on net change in asset position in the condensed expenditure schedule. The schedule consisted of 29 pages, 1½ of which were on family expenses. The average interview time in this survey was 1½ hours.

The survey that used detailed questions on family living expenditures, survey B, was conducted by BHNHE in Illinois only. Its focus was on family expenditures, but it also obtained information on family income, changes in assets and liabilities during the year, composition of the family, and food production for home use. The schedule consisted of 33 pages, 20 of which were on family expenses, and the average interview time was about 3 hours.

Comparison of Schedule Designs

In this experiment, only one form of condensed questions was tested against one form of a more detailed set of questions. Conclusions as to relative quality of data might well differ according to the degree of summation involved. In general, the condensed questionnaire used represents as extreme a degree of summation as would be considered reasonable. The detailed schedule represents as much detail as was considered feasible for an interview that covered all family living expenditures. Schedules with more detail have been used to cover total family spending. More detailed schedules have often been used when food and clothing were studied separately.

On the condensed schedule, one question (called a global question) was asked for each of 15 categories of family living expenditures: Food, clothing, housefurnishings and the like. In the more detailed set, an expenditure category was broken down to major items or groups of smaller items that might be thought of together. The contrast between the schedules in the degree of summation varies widely among the categories, depending on the content.

TOTAL FAMILY LIVING EXPENDITURE.—The two schedules build up estimates of total family

[2] Throughout this study the term "family" covers single-farm-operator units as well as farm-operator families of 2 or more.

living expenditures from widely different amounts of detail. In one it is the sum of 15 category estimates; in the other it is the sum of about 200 possible items of family expense grouped into categories, plus 14 to 37 clothing items for each individual.

EXPENDITURE CATEGORIES. – Differences between the two schedule forms among categories were greatest for clothing. The detailed questionnaire included separate lists of readymade clothing items that might have been bought for men and boys, women and girls, and infants, to be used for each member of the family. In addition, there was a section on expenditures for clothing made at home and a section on general clothing expenditures not mentioned elsewhere, such as shoe repairs and cleaning. In contrast, the global question asked about: "Clothing, including jewelry, dressmaking costs, and shoe repair."

The schedule forms differed almost as much for another category, housefurnishings. The detailed schedule listed 57 groups of items under 7 general headings. The global question asked about expenditures for "furniture and furnishings for the house; that is, all kinds of furniture and equipment like stoves, refrigerators, and washing machines; glass and chinaware and cooking utensils, household linens, bedding, curtains and things like that."

Medical expenditures were handled on the detailed schedule in 17 questions and personal care in 8, compared with 1 question each in the condensed approach. The contrast is less on the categories, reading and contributions, where the content is likely to be less complex. The detailed schedule had 5 and 4 questions each on these. The difference is least for income taxes and life, burial, and accident insurance; the more detailed schedule asked 3 questions each on income taxes and insurance.

The condensed questionnaire had questions on each of eight other categories of spending, but there is no way to recombine the data from the more detailed schedule to provide estimates that would match them individually. An "other" category, comprising primarily food and household operation, can be built up and used in the comparison, although the condensed approach is far from that of a single global question for the category.

FAMILY.–The two schedules defined the reporting unit differently. This affects reporting of expenditures. In part, this is a difference in the degree of precision possible with the condensed and the more detailed approaches, and in part a difference in the design of the schedules.

A clear understanding of family composition to be covered is particularly important to insure complete reporting on the more personal types of expenditures, such as clothing, medical care, or personal care, in a household containing (1) persons living as family members only part of the year and (2) older sons and daughters or adults related to the family head but not completely dependent on the family income pool. Expenditures and income of secondary units (often older sons and daughters) were specifically included in the family estimates along with those of the primary unit in the estimates from the more detailed questionnaire, but those of other persons living in the household such as farm laborers or household help were excluded. Thus, expenditure data from the detailed schedule cover spending of all persons related to the farm operator who lived in the household for part or all of the year.

Early in the interview with the detailed schedule, survey B, the composition of the family was ascertained, including the number of weeks each person was a member of the family.

In survey A, on the other hand, no attempt was made to establish whether expenditures of persons who were in the family only part of the year, or of secondary families, were to be included. The schedule merely requested information on "family" expenses. In another section of the schedule, questions were asked on population characteristics of all persons in the household. One such question asked the relationship to the head of household. It can only be assumed that the family expenditures referred to in the condensed questions are those of all related persons living in the household. Comparison of data is made on this basis. But in individual cases there is some doubt as to whether expenditures of part-year persons and relatives who lived with the primary family, but had some degree of financial dependence, are covered in the condensed schedule.

Uncertainty as to the composition of the

family group whose expenditures are to be reported is not a necessary result of use of a condensed schedule. It might have been avoided in survey A by a moderately detailed section on family composition to be related specifically to the expenditure questions in the schedule design, or perhaps by a statement on coverage in the enumerator's introductory remarks for the family expenditure section.

INCOME.—Differences between the two schedules are small in the sections on gross farm income, farm expenses, income from wages, salaries, or nonfarm business, and other family income.

BALANCE.—A "balanced schedule" was an intrinsic part of the schedule design for survey B. As the schedule covered income, expenditures, and net changes in assets and liabilities during the year, reported disbursements could be balanced against receipts. The field supervisor used this as a check on the reasonableness of entries. In cases out of balance more than 10 percent he asked the interviewer to revisit the family and request additional information. After this further inquiry, however, schedules were accepted for tabulation even if they remained out of balance. This procedure was adopted to provide a reasonableness check without encouraging interviewers to force entries into balance, and it undoubtedly added to the accuracy of the expenditure data obtained in survey B.

A balanced schedule design was not part of the condensed approach. Balancing reported receipts against disbursements as a reasonableness check implies revisiting, which works against the speed and low cost that are objectives of the shortcut method. Balancing might be used, however, with a more summary schedule than the one used in survey B.

Comparison of Sample and Field Procedures

SAMPLE DESIGN.—The sampling procedures provided for two parallel probability-area samples. The sample for the schedule with the more detailed questions on family expenditures was designed to be 10 percent smaller than the other sample, and segments chosen were usually adjacent to the ones selected for the other sample.

FIELD PROCEDURES.—Interviewing for both surveys started in January 1947. Training for both included practice in taking a schedule from a family not in the sample. In survey B, the ratio of supervisory time to interviewer time was probably higher; and since only one State was involved rather than 48 as in survey A, direction from the central office was more evident.

In each survey interviewers found about the expected number of farms in the sample segments in Illinois, but there were marked differences in the proportion interviewed (table 1). In survey A only 69 percent of the farmers identified as having headquarters in sample segments were interviewed, whereas 86 percent were interviewed in the other survey. However, as indicated later, the lower percentage for survey A was partly by design.

Supervisory attitudes regarding the necessity for contacting all sample farmers and for obtaining complete answers to all parts of the schedule probably differed between the surveys. This was undoubtedly related to differences in funds budgeted for the field work. Both survey designs originally called for some revisits to families not at home the first time.

TABLE 1.—*Number of farms identified and farm-operator families interviewed, 2 samples, Illinois, January 1947* [1]

Item	Survey A	Survey B
	Number	*Number*
Farms identified [2]	576	529
Farm-operator families interviewed	400	454
Farm-operator families not interviewed	176	75
Omitted because of subsampling	[3] 11	0
Refused [4]	31	49
Omitted for other reasons [5]	134	26

[1] Survey A had condensed family expenditure questions; survey B, more detailed questions.

[2] Excludes institutional farms and idle or vacant farms.

[3] Subsampling was used in a few segments having large numbers of farms. Weighting was introduced into tabulation procedures to allow for these and 23 other cases not interviewed; thus, tabulations show 434 cases instead of 400.

[4] Refused outright or gave such meager information that no part of the schedule was usable.

[5] Interviewer did not contact adult family member; the principal reason was no adult at home.

In survey B, the rule was that at least three attempts at varying times of day were to be made to get in contact with the family. In survey A interviewers were instructed to make at least one try to obtain a schedule in the first phase of enumeration, or more trials if necessary to get 75 percent interviewed. (This, however, was not accomplished in all segments.) Then in the second phase further followups were to be made in a third of the segments as specified by the State supervisor. (The interviewer did not know which segments were to be "cleaned up" until the first phase was completed.)

The sample design called for weighting the cleanup interviews in survey A to represent the non-respondents, including those not followed up. However, checks made at the regional level showed remarkably close agreement between cleanup and other interviews on selected items, so it was not believed necessary to give additional weight to the cleanup interviews. The low proportion of eligible farm families interviewed in survey A may have introduced a non-respondent bias, which accounts in part for differences found between the two surveys.

The family member who was asked about expenditures often was different in the two surveys, and this may also affect the comparability of the data obtained. As the survey with the condensed questions on family expenditures was primarily a study of farm-operation information, the enumerator was instructed to interview the farm operator and he or she may not have taken the additional time to interview the farm wife about family expenses. This procedure may well have affected the quality of the estimate obtained in survey A. In the other study, the farm wife was usually the respondent for the family expenditure questions, and the farmer for income data. This difference in field procedures might be considered to be a procedural discrepancy that interferes with a precise comparison of answers to global and detailed questions. Or the difference may be viewed as part of the schedule differences to be tested if approximate answers obtained from any adult family member are considered to be a characteristic of the condensed questionnaire.

EXTENT TO WHICH TWO SAMPLES ARE PARALLEL.—Although the sample design was planned to give two parallel samples, the two sets of schedules obtained are not parallel.

Even though the samples were stratified by type-of-farming area, comparable numbers of schedules were not obtained in the Specialized Dairy Area because an urban segment with a large number of farms happened to be drawn for survey A. As a result, survey A had somewhat more crop farms and fewer dairy and livestock farms than survey B. Differences between the two survey groups as to acres in farm and tenure are small and within the range of possible sampling error. They probably do not affect markedly the family expenditure comparison made in this study, and they do not account for differences in income distribution.

Income differences are marked (table 2). Differences this great in the distribution could be expected to occur by chance in two parallel samples less than 1 in 100 times. Examination of the schedules county by county shows lower incomes in survey A than in survey B in most of the counties surveyed.

Average family income in survey A is $2,790, or about $270 lower than in survey B (table 3). The difference in net farm income amounts to about $225 owing to higher farm expenses reported in survey A. Gross cash farm income was also reported higher in that survey.

In both surveys farm receipts were probably underreported, a common situation in income surveys. It is likely that farm expenses were underreported less in survey A than in survey B; net farm and family income estimates in survey A are lower. The ratio of farm expenses to gross farm income in survey A is higher than in survey B for each of 4 acres-in-farm groups. The ratios for survey A seem the more reasonable of the two sets when compared with ratios obtained from Illinois farm account books for 1946 (table 4).[3]

Two factors probably are important in explaining the differences between family income

[3] REX F. DALY in INCOME SIZE DISTRIBUTION FOR ILLINOIS FARM-OPERATOR FAMILIES, a processed publication issued by the University of Illinois with the Bureau of Agricultural Economics cooperating, 1949, pp. 18, 22, and 56, adjusted for underreporting of income in the higher income classes, and still concluded that Illinois aggregate gross farm receipts as estimated from survey A were only 83 percent of those estimated from other sources by BAE, and farm expenses were 88 percent.

TABLE 2.—*Income distribution, 2 samples of farm-operator families, Illinois, 1946* [1]

Net cash family income	Survey A	Survey B	Percentage distribution		Probability [2]
			Survey A	Survey B	
	Number	*Number*	*Percent*	*Percent*	*Percent*
Negative	22	17	5.7	3.9	23
$0–$999	88	73	23.0	16.8	3
1,000–1,999	74	82	19.3	18.8	86
2,000–2,999	68	81	17.8	18.6	76
3,000–3,999	36	79	9.4	18.2	1
4,000–4,999	36	39	9.4	9.0	84
5,000–7,499	32	41	8.4	9.4	62
7,500–9,999	20	11	5.2	2.5	4
10,000 and over	7	12	1.8	2.8	34
Total reporting	383	435	100.0	100.0	-----

[1] Survey A, condensed family expenditure questions; survey B, more detailed questions.

[2] Probability of difference as large as observed occurring because of sampling variation, based on t-test for each income class.

estimates from the two surveys. First, within the framework of the total interview, there was more emphasis on the farm business in survey A even though the questions on farm operating expenses were the same in the two surveys. This may have elicited fuller answers on farm expenses by a family reporting, and thus contributed to a lower estimate of total family income. In this respect survey A is probably more accurate. Second, the large proportion of sample cases not interviewed in survey A probably contributed to income being reported too low. Both factors operated to push apart the two survey estimates of income.

TABLE 3.—*Average income by source of income, 2 samples of farm-operator families, Illinois, 1946* [1]

Item	Survey A	Survey B
	Dollars	*Dollars*
Farm income:		
Gross cash	5,188	5,052
Farm expenses	2,969	2,606
Net farm income	2,219	2,446
Wages, salaries, and nonfarm business	449	485
Other income [2]	122	127
Net cash family income	2,790	3,058

[1] Survey A had condensed family expenditure questions; survey B, more detailed questions.

[2] Net income from roomers and boarders, interest, dividends, royalties, net rents, dependency allotments, veterans payments, annuities, retirement benefits, unemployment compensation, sale of personal property, and contributions for support from persons outside the immediate family.

Method of Comparison [4]

To separate differences in State averages that could be attributed to schedule design from those that resulted from differences in the interview rate, it was necessary to weight the data to the same income distribution. Comparisons were made of schedules from units with incomes under $7,500. (The higher income families surveyed were small in number and had different family types and sizes on the average in the two surveys.) Each income class up to $7,500 was compared as reported in the two surveys. Overall State averages presented are averages by income classes in each survey, weighted together by the pooled income distribution from the two surveys. This procedure does not allow for differences in income level that occurred because of greater emphasis on the farm business in survey A. However, the distortion of the income distribution for such reasons would

[4] Data presented in this analysis will not necessarily agree with those published elsewhere from either of the two surveys as definitions and methods of tabulation used by the two Bureaus independently were adjusted in the retabulation to provide comparability and better meet purposes of this analysis.

TABLE 4.—*Ratio of average farm expenses to average cash receipts by size of farm, Illinois, 1946* [1]

Size of farm	Survey A [2]	Survey B	Farm account data [3]
	Percent	*Percent*	*Percent*
Under 50 acres	92.5	72.5	----
50–139	59.6	56.0	[4] 51.0
140–259	53.6	49.6	52.7
260 and over	61.7	50.7	59.8
All farms 50 acres and over	57.4	51.1	56.4
All farms	58.4	51.8	----

[1] Survey A had condensed family expenditure questions; survey B, more detailed questions.

[2] Estimates differ from those shown in REX F. DALY, INCOME SIZE DISTRIBUTION FOR ILLINOIS FARM-OPERATOR FAMILIES, a processed publication issued by the University of Illinois with the Bureau of Agricultural Economics cooperating, 1949, p. 18, because of retabulation to ensure comparability of surveys A and B and because acreage weights were not used for this analysis.

[3] DALY, (see footnote 2), p. 18. Interest payments are not included in expenditures; the ratios shown are expected to be somewhat lower than the survey data because the accounts included relatively more large farms.

[4] Number of cases is smaller than in the other acreage groups.

suggest that the differences observed are understated rather than overstated.

Comparison of Estimates

TOTAL FAMILY EXPENDITURES.—The estimate of total spending that was the sum of answers to a single question on each of 15 categories was 10 percent lower than the average built up from more detailed questions; the average was a little more than $1,500 in survey A and nearly $1,700 in survey B (table 5). This difference is greater than would be expected because of sampling variation ($P<0.01$).

In the lower income classes, differences between total family expenditures reported in the two surveys are not statistically significant at the 5-percent level, but at higher income levels, where expenditures are greater, differences are marked (table 6). The condensed questions resulted in averages 15 to 25 percent lower than the more detailed questions in the three income classes from $2,000 to $7,500. This finding is consistent with earlier conclusions.

Previous work on this problem indicated that more detailed questions result in a larger total than a summary question. In the crop-estimating work of the Bureau of Agricultural Economics using mailed inquiries, it has been reported that a larger total results when a quantity is obtained by asking for several subgroups separately than when only a lump sum is requested.[5] Dorothy Brady and Faith Williams reported in 1945 on a study of the "short" versus "long" schedule forms based on a small number of cases.[6] They found that a schedule itemizing goods and services gave higher estimates than the condensed form.

Actually, in the present case it is probable that even with the more detailed schedule the total expenditure is underestimated. Both the condensed and the more detailed schedules involve the respondent's recalling expenditures for the previous year. Thus, both sets of data are subject to memory bias. Although it is possible to have overreporting, as for example through reporting major expenditures that actually occurred outside the schedule year or exaggeration of prestige items, such errors are probably outweighed by underreporting. Brady and Williams reported that rural and urban expenditures in 1941, which were based on enumerative surveys using detailed schedules, were 93 percent of the Department of Commerce aggregate expenditures for the country as a whole.[7]

SAVINGS.—The savings estimate from survey B was obtained from questions on net changes in assets and liabilities, but in survey A, as part of the condensed approach, no questions were asked on this subject. Thus the net-change-in-savings figure from survey A was obtained by subtraction of family expenditures and taxes from income. With such a method the savings estimate is affected by underreporting of family expenditures and errors in reporting income or taxes; that is, the balancing difference is

[5] THE GENERAL ENUMERATIVE SURVEYS—II. op. cit., p. 125.

[6] BRADY, DOROTHY S., and WILLIAMS, FAITH M. ADVANCES IN THE TECHNIQUES OF MEASURING AND ESTIMATING CONSUMER EXPENDITURES. Jour. Farm Econ. 27(2): 315-344. May 1945. p. 342.

[7] Ibid.

TABLE 5.—*Selected expenditures, 2 samples of farm-operator families with income under $7,500, Illinois, 1946* [1]

Item and survey	Unit	Family living expenditures				
		Total	Clothing	Furnishings, including equipment	Personal care	Medical care
Average per family in group:						
Survey A	Dollars	1,515	205	137	34	133
Survey B	do	1,687	286	167	40	122
Difference [2]	Percent	−10	−28	−18	−15	9
Probability [3]	do	<1	<1	6	1	42
Coefficient of variation: [4]						
Survey A	do	23.7	38.6	66.9	42.6	62.0
Survey B	do	19.6	28.2	58.8	31.2	64.9
Probability [3]	do	<1	<1	4	<1	47
Percentage of families making expenditures:						
Survey A	do	100	96	67	97	90
Survey B	do	100	100	96	99	97
Probability [3]	do	-----	<1	<1	28	<1
Average per family making expenditures:						
Survey A	Dollars	1,515	213	204	35	146
Survey B	do	1,687	286	173	41	126
Difference [2]	Percent	−10	−26	18	−15	16

Item and survey	Unit	Family living expenditures—Con.				
		Contributions	Reading	Insurance	Other [5]	Income taxes
Average per family in group:						
Survey A	Dollars	67	17	76	846	152
Survey B	do	89	16	68	899	114
Difference [2]	Percent	−25	6	12	−6	33
Probability [3]	do	1	22	22	15	2
Coefficient of variation: [4]						
Survey A	do	60.0	43.2	53.3	27.9	59.1
Survey B	do	51.6	40.5	54.4	20.4	63.7
Probability [3]	do	1	24	73	<1	24
Percentage of families making expenditures:						
Survey A	do	97	97	68	100	64
Survey B	do	96	94	69	100	61
Probability [3]	do	47	19	70	-----	37
Average per family making expenditures:						
Survey A	Dollars	69	18	109	846	210
Survey B	do	91	17	91	899	161
Difference [2]	Percent	−24	6	20	−6	30

[1] Standardized by pooled income distribution. Survey A had condensed family expenditure questions; Survey B, more detailed questions.

[2] Survey A estimate minus survey B estimate as percentage of survey B estimate.

[3] Probability of difference as large as observed occurring because of sampling variation with samples the size of these, based on t-test using weighted standard error of difference.

[4] Standard deviation as percentage of mean.

[5] Primarily food and household operation.

added into the savings estimate. The understatement of family expenditures in survey A previously observed undoubtedly is a major factor in the difference between the savings estimates from the two surveys (table 7). Comparison is made difficult in this study by the definitions of income and family expenditures used, and the combination in the residual of other items with net change in assets and liabilities.

TABLE 6.—*Selected expenditures by income groups, 2 samples of farm-operator families, Illinois, 1946* [1]

Net cash family income and survey	Unit	Net cash family income	Family living expenditures			
			Total	Clothing	Furnishings, including equipment	Personal care
$0-$999:						
Survey A	Dollars	502	1,038	137	84	22
Survey B	do	579	925	123	125	20
Difference [2]	Percent	−13	12	11	−33	10
Probability [3]	do	------	30	43	24	50
$1,000-$1,999:						35
Survey A	Dollars	1,536	1,571	191	148	
Survey B	do	1,507	1,386	226	136	30
Difference [2]	Percent	2	13	−15	9	17
Probability [3]	do	------	14	16	76	26
$2,000-$2,999:						
Survey A	Dollars	2,601	1,443	238	163	35
Survey B	do	2,425	1,792	314	179	45
Difference [2]	Percent	7	−19	−24	−9	−22
Probability [3]	do	------	<1	3	69	10
$3,000-$4,999:						
Survey A	Dollars	4,047	1,807	242	148	43
Survey B	do	3,748	2,121	397	192	56
Difference [2]	Percent	8	−15	−39	−23	−23
Probability [3]	do	------	1	<1	12	2
$5,000-$7,499:						
Survey A	Dollars	6,111	2,033	262	181	43
Survey B	do	6,094	2,759	478	225	61
Difference [2]	Percent	[4]	−26	−45	−20	−30
Probability [3]	do	------	<1	<1	45	<1

Net cash family income and survey	Unit	Family living expenditures—Con.					Income taxes
		Medical care	Contributions	Reading	Insurance	Other [5]	
$0-$999:							
Survey A	Dollars	90	35	11	48	611	19
Survey B	do	82	35	8	24	508	12
Difference [2]	Percent	10	0	38	100	20	58
Probability [3]	do	78	------	3	4	12	50
$1,000-$1,999:							
Survey A	Dollars	167	55	15	78	882	58
Survey B	do	116	55	14	38	771	49
Difference [2]	Percent	44	0	7	105	14	18
Probability [3]	do	19	------	56	<1	17	66
$2,000-$2,999:							
Survey A	Dollars	103	74	21	54	755	169
Survey B	do	125	81	14	63	971	85
Difference [2]	Percent	−18	−9	50	−14	−22	99
Probability [3]	do	31	72	8	48	<1	4
$3,000-$4,999:							
Survey A	Dollars	172	75	20	89	1,018	213
Survey B	do	139	122	21	100	1,094	204
Difference [2]	Percent	24	−39	−5	−11	−7	4
Probability [3]	do	22	<1	62	43	36	77
$5,000-$7,499:							
Survey A	Dollars	153	118	25	160	1,091	444
Survey B	do	186	229	32	171	1,377	322
Difference [2]	Percent	−18	−48	−22	−6	−21	38
Probability [3]	do	45	6	28	79	4	17

[1] Average per family in group. Survey A had condensed family expenditure questions; survey B, more detailed questions.

[2] Survey A estimate minus survey B estimate as percentage of survey B estimate.

[3] Probability of difference as large as observed occurring due to sampling variation with samples the size of these based on t-test.

[4] 0.5 or less.

[5] Primarily food and household operation.

TABLE 7.—*Farm family spending pattern, 2 samples of farm-operator families with income under $7,500, Illinois, 1946* [1]

Item	Survey A	Survey B
	Percent	*Percent*
Income	100	100
Disbursements:		
Family living expenditures [2]	62	71
Income taxes	6	5
Net change in assets and liabilities [3]	32	13
Purchase of farm equipment		12
Family share of automobile expense		6
Other receipts [4]		−5
Balancing difference		−2
Total family living expenditures [2]	100	100
Clothing	14	17
Furnishings, including equipment	9	10
Personal care	2	2
Medical care	9	7
Contributions	4	5
Reading	1	1
Insurance	5	4
Other (primarily food and household operation)	56	54

[1] Standardized by pooled income distribution. Survey A had condensed family expenditure questions; survey B, more detailed questions.

[2] Includes contributions and life insurance premiums, but excludes family share of automobile expenses.

[3] Excludes life insurance premiums. The proportion of income saved shown in this study is lower than it would have been if net change in inventory of crops and livestock had been included in income and in change in assets as is done in many studies.

[4] Cash gifts other than regular support and inheritances, lump sum settlements on insurance or property, and sale of farm equipment. The schedule for survey A did not specifically cover these items and they were not listed in the overall "other" category on any schedule, but they were reported by 16 percent of the families in survey B.

SPENDING PATTERNS.—As has been observed in comparing other expenditure studies, even though considerable differences appear when dollar expenditures are compared, the pattern of spending appears to be much the same. In this study, despite different levels of spending, the pattern of distribution of expenditures among major categories differed only slightly in the two surveys. The condensed questions showed a lower proportion spent by all families for clothing and more for medical care and "other," which is primarily food and household operation, than the more detailed questions revealed. The differences amounted to 2 and 3 percent of the total budget.

EXPENDITURE CATEGORIES.—The greatest difference in estimates of major spending categories from the two types of schedule is found in clothing—the category in which schedule differences between the global and detailed approach are most marked. The global question elicited an average clothing expenditure estimate per family of about $205, nearly 30 percent lower than the average of about $285 per family shown by the more detailed questions ($P < 0.01$). In addition, 4 percent of the families reported with the global question on clothing that they had no clothing expense during the year, whereas none so reported on the detailed schedules ($P < 0.01$). Except at the lowest income levels, the global estimate of clothing expenditures was lower than the detailed, with the difference increasing at successive income levels.

Expenditures for housefurnishings contrasted between the global and detailed responses almost as much as with clothing. But here the dollar amount per family that reported such expenditure was higher with the global question; yet only two-thirds of the reporting units interviewed with the global question reported spending any money for furnishings and equipment, compared with 96 percent of the units interviewed with the more detailed questions. It may have been that the respondent thought only of major purchases of furniture and equipment, even though reminded of dishes, pans, linens, curtains, and the like in the global question. The low proportion reporting this type of expenditure occurred in each income class. The net effect was an average expenditure for furnishings per family that was about 20 percent lower than the estimate based on the more detailed question ($P=0.06$).

For personal care and contributions the global questions resulted in average expenditures that were 15 and 25 percent lower than averages based on the more detailed questions ($P < 0.01$). In each of these categories, understatement by the global approach was observed at higher income levels.

The "other" category was 6 percent lower in survey A, a difference that was not statistically significant. "Other" is primarily food and

household operation but it covers eight questions on the global questionnaire that must be considered as a total here because individual items from the two surveys could not be matched. No analysis was made in this study of the food estimates because of inability to match definitions, but it seems likely that the respondent's estimate of annual food expenditures is improved when the same interview covers detailed food expenditures for a recent week as well as data for the past year. The differences shown might have been greater if an improved section on annual food expenditures had been used in the more detailed schedule; actually schedule differences between the two tested were not as great for food as for any of the other major spending categories.

The global questions produced higher estimates of medical care expenditures, which are among the most variable, and the difference found could well have come from sampling variation. Differences found in insurance also could have been due to sampling variation. They occurred in the lower income classes, but agreement was close at the higher levels. The overall averages for reading expenditures differed by only a dollar. These are the exceptions to the findings that the global questions elicited lower estimates of family expenditure categories than did the more detailed questions at the middle and higher income levels, with differences at those levels increasing with income.

Reporting Problems

INCOMPLETE SCHEDULES.—Failure to obtain an estimate for an item, here called a "no report," was more extensive in survey A. In that survey 33 families that gave information on the other sections of the schedule gave no data at all on the family living section. In addition, "no reports" on the individual categories of family living ranged from 1 to 5 for most categories, and there were 19 for contributions. As a result, in 63 schedules, 15 percent of all respondents, the total amount spent for family living was not obtained.

In survey B, there were no incomplete schedules on any of the selected family living categories except clothing. Expenditures for family clothing and total family living were incompletely reported on 27 schedules, 6 percent of the total.

"No reports" in the clothing section for survey B were usually omissions of clothing expenditures for one or two members of families otherwise reporting such expenditures; 27 families did not give information for 38 persons. Most frequently the person had been a family member for only part of the year. The second most common omission was clothing expenditures of an older son or daughter who was a member of the family but bought all his own clothes and was not available to give the information. Incomplete reporting from both of these sources is likely to occur regardless of the type of schedule used. It may well have occurred in survey A also but it is not evident there because reporting was for the family, not for individuals.

Possible differences in enumeration methods and emphasis between the two surveys make it difficult to relate differences in completeness of schedules to the type of schedule used. The differences in frequency of "no reports" certainly do not suggest that, within the limits set by these two schedules, the number of "no reports" increases with the schedule detail. They do suggest that global questions elicit more incomplete schedules than the detailed approach, but they cannot be used to prove it. Some of the differences may be due to differences in training and supervision of interviewers and in schedule emphasis on the family living questions. Some may be due to the person interviewed—whether it was the farmer or his wife. The emphasis on a balanced schedule in survey B with revisits to complete schedules that were extremely out of balance, undoubtedly contributed to complete reporting in that survey.

ROUNDED AND EXTREME ANSWERS.—It is to be expected that the answers to global questions will be rounded off as, for example, $50, $200, or $1,000 for a particular category. This occurred in survey A. The global questions also elicited more extreme answers and thus more variability in answers than the more detailed questions (table 5). The balancing procedure that went along with the more detailed questions probably was a factor in the lower variability observed in survey B. The greater variability of answers to global questions occurred

in the same categories for which the resulting averages were considerably lower than those based on the more detailed questions.

Reasonableness of Estimates

Average expenditures do not increase as smoothly with income in the estimates derived from the global questions as those based on the more detailed schedule (table 6). This is due partly to the smaller sample that resulted from the lower interview rate in survey A. But it also shows the greater variation in the responses obtained. In contrast, the averages based on the more detailed questions appear more reasonable in terms of relatively smooth progress with increase in income.

Income elasticities estimated with data from the global questions are unreasonably lower than those based on data from the more detailed schedule for clothing, personal care, contributions, reading, and "other" (table 8). Elasticities of the major categories of family living expenditures from survey A range only from 0.2 to 0.5 compared with a range from 0.3 to 0.8 for survey B estimates. Despite these differences, the rank of the categories with respect to income elasticity is approximately the same in the two surveys.

Global questions did not provide a lower estimate of income elasticity than the more detailed questions for housefurnishings and medical care. The small difference in income elasticity for medical care is not statistically significant, and the variability of medical care expenditures in survey A is so great that little reliance can be put on the elasticity estimate. The elasticity of furnishings in both surveys is abnormally low. The supply situation for furnishings in 1946 was still affected by the war situation, and spending for these items was influenced markedly by a backlog of demand and savings from World War II years.

The two Illinois surveys had similar income elasticities for income taxes. This category was among those with the smallest differences in the amount of detail asked for in the two surveys. Another such category was insurance. Its elasticity was lower for data from the global questions, but the relative changes in the income-expenditure relationship for insurance in survey A were so erratic that little reliance can be put on the estimate of income elasticity, and differences were not statistically significant ($P=0.07$).

TABLE 8.—*Income elasticity of farm-operator family living expenditures* [1]

Item	Farm units			
	Illinois, 1946		White, Tennessee, 1944	2 counties, Mississippi, 1945 [2]
	Survey A	Survey B		
Family expenditure categories:				
Medical care [3]	0.2	0.3	0.6	0.1
Furnishings	.3	.3	.6	.7
Other [4]	.2	.4	.6	.4
Personal care	.3	.5	.5	.6
Reading	.3	.6	.5	.4
Clothing	.3	.6	.6	.6
Insurance	[3].4	.8	.8	1.1
Contributions	.5	.8	.6	.7
Total family expenditures	.2	.5	.6	.5
Income taxes	1.3	1.4	1.7	1.9

[1] For Mississippi and Tennessee, based on incomes from $0 to $5,000; for Illinois, both surveys based on income from $0 to $7,500. Calculated from average expenditures classified by net cash family income, using a least square regression and assuming constant income elasticity throughout range. Income was adjusted for inventory change in Mississippi study, but not in other studies. Illinois survey A had condensed family expenditure questions; survey B, more detailed questions.

[2] Farm units with at least $200 farm sales.

[3] Income expenditure relationships erratic so that less reliance can be put on the elasticity estimate.

[4] Primarily food and household operation.

The survey B estimates of income elasticities are in line with those obtained in two other farm family living expenditure studies made in about the same period with the more detailed type of questionnaire. They thus appear to be more reasonable than those from survey A.

Conclusions and Possibilities for Future Use

In schedule design, as in sampling, the degree of accuracy that can be afforded must be decided in the light of each study purpose and of money available.

If the global questions are to provide estimates of major categories of spending as well as the total spending estimate built up from the categories, a schedule as condensed as that

used in survey A gives so little and such inaccurate information as to be almost worse than nothing. Steps that might be taken to improve the estimates are probably incompatible with the basic idea of adding a few overall questions at little additional cost to a survey obtaining other data.

If global questions on categories are used only to build up a total of family living expenditures, but not to provide estimates for the categories, a condensed schedule might yield valuable results if a few improvements were made in the schedule design and field procedures. In this study, the total family spending estimate built up from the summary questions was 10 percent less than the total built up from the detailed questions, which is in addition to an unknown understatement by the detailed questions used.

Uses for estimates of total family living expenditures with no breakdown by major categories, however, are limited. One use might be as an intermediate figure in deriving savings by subtracting the expenditures from net family income. In such a procedure, errors in the expenditure and income estimates are passed on to the savings estimate. This study suggests that even though the total family expenditure estimate obtained from a condensed schedule might be sufficiently reliable for some uses, its error would be too great to permit its use in deriving savings by subtraction from income.

Something between surveys A and B in amount of detail of schedule could serve some limited purposes—estimating total expenditures plus internal relationships of main categories. Such a schedule would have to be used with the expectation that some understatement would be involved, but enough detail would have to be used that internal relations would not be seriously distorted. Global questions might be used for smaller categories such as personal care and contributions, knowing that underestimates larger than likely sampling error would probably result. Somewhat more detail might be needed in the food section than was used here in the more detailed schedule. Moreover, the experience reported here shows the difficulties of administering a short schedule on family expenditures as a subordinate part of a larger study.

For some purposes, of course, an even more detailed schedule than used in survey A would be justified.

Procedure for Adjusting 1940 Census Data for College Students To Be Comparable with 1950 Data

By Burton L. French

In 1950 the Bureau of the Census changed its method of enumerating college students. In the census of that year the students were counted as residents of the localities in which they were attending college. This change makes comparisons between 1940 and 1950 census reports on population questionable, particularly comparisons between those reflecting such factors as migration estimates and extrapolation of population changes for making current population estimates. In connection with the work of the North Central Population Dynamics Technical Committee, NC-18, a procedure for adjusting the 1940 population data to make it comparable with the 1950 data was considered necessary so that the estimates of migration into or out of a geographic area would represent the true change. This paper presents the procedure the author developed for estimating the number of students attending college from the rural and urban areas of each county in a State, based upon the census data, to be used in adjusting the 1940 data. Research work that is being initiated by the Northeast Population Dynamics Technical Committee, NE-17, will include adjustments of the 1940 census data through the use of this procedure. Helen R. White, formerly of the Farm Population and Rural Life Branch, AMS, is to be credited with ideas leading to the procedure. Many suggestions have been received from members of the North Central Population Dynamics Technical Committee, especially from Margaret Jarman Hagood and Paul J. Jehlik, Farm Population and Rural Life Branch, AMS, and Henry S. Shryock, Jr., Division of Population and Housing, U. S. Bureau of the Census. The paper is published with the approval of the Director of the Nebraska Agricultural Experiment Station as Journal Series Paper No. 629.

TO BE CONSISTENT with the usual Census practice of enumerating a person as "an inhabitant of his usual place of residence or usual place of abode," [1] the method of enumerating college students was changed for the 1950 Census. In 1950 college students living away from home were considered residents of the communities in which they were residing while attending college, instead of persons temporarily absent from their parental homes as was the practice in 1940 and earlier periods.

In ascertaining population migration from county to county, rural to urban, or any other sensitive comparison of various population figures, this change in enumeration introduces additional error. In 1940 1,537,249 persons were attending college in this country. Most of these would be persons enumerated at their parental homes, but absent from those homes. Of this number 479,495 were classified as rural-farm and rural-nonfarm. Few of our colleges are in rural areas. Therefore, as part of any net migration from rural to urban areas is in terms of a change in enumeration procedure, any estimate of it would be biased.

An example of the rural to urban shift caused by this change is shown by comparing the percentage of students counted as in rural and urban areas of the United States for the Censuses of 1940 and 1950 (table 1). The proportion of college students in urban areas was very high in 1950 and, without the necessary adjustments, it would erroneously increase an estimate of migration from rural to urban areas. The error in a net-migration estimate for a

[1] UNITED STATES BUREAU OF THE CENSUS. 1950 CENSUS OF POPULATION, VOL. II, PART 27, NEBRASKA. pp. XII-XIII, v-vi.

county or part of a county containing a college could be substantial.

Adjustment of 1940 Data

Adjustment of the 1940 Census figures to make them comparable with 1950 data consists of two steps: (1) Subtracting from the population figure in each county the number of college students residing in the county but attending school in another county or State, and (2) adding to the figure for each county where colleges are located the number of students enrolled in the colleges from other counties or States. The first step may be accomplished by at least two methods: (1) Obtaining the college enrollment from each college in the State by counties, or (2) estimating the number of college students from rural and urban areas by counties on the basis of 1940 Census data.

Both methods have advantages and disadvantages. The main advantage for the first method is the greater accuracy in the data obtained from the colleges. Disadvantages are: First, obtaining the college registration from the colleges by counties is uncertain as many schools retain no record of their students by residence or they cannot provide the labor to transcribe the data; and, second, short of a national survey of colleges it is impossible to obtain data on students who have migrated outside the State to other colleges. This out-of-State migration in 1938-39 was 236,444 students for the United States, or 19.2 percent of all college students.[2]

Advantages for the second method are: First, it is less time-consuming; second, the estimation procedure is based on census data, as it is the census data that are to be adjusted; third, the adjustments take into account all college students whose home residence was in the State, and not only those attending college in the State; and fourth, the adjustments are not dependent upon compilation of data by various colleges. The primary disadvantage of the second method is that the estimation procedure is linear for all counties of the State when actually the proportion of students attending college differs from county to county.

TABLE 1.—*Distribution of college students, rural and urban areas, 1940 and 1950, United States*

	Number Attending College	Percentage of total
	Number	*Percent*
Total		
1950	2,164,425	100.00
1940	1,537,249	100.00
Urban		
1950	1,868,105	86.31
1940	1,057,754	68.81
Rural-Nonfarm		
1950	239,765	11.08
1940	253,997	16.52
Rural-Farm		
1950	56,555	2.61
1940	225,498	14.67

Procedure for Adjustment

The first step in the adjustment procedure is to estimate the number of college students who were counted as residents of the rural and urban areas of each county in 1940. The 1940 Census reports in table 17, volume IV, Population, the number of persons attending school by years of school completed, single years of age for the State, urban and rural areas, and for cities of 50,000 or more. The number of persons attending school by age groups of 14 and 15, 16 and 17, 18 to 20, and 21 to 24 years old by counties is presented in table 21, volume II, Population. All of the estimates of this step are based upon the information in these two tables. The age groups of 18 to 20 and 21 to 24 years are used for the adjustment, as these groups comprise 85 percent of all college students in the country.[3]

For purposes of this paper counties are classified according to the following definitions:

[2] KELLY, FRED J., and ECKERT, RUTH E. RESIDENCE AND MIGRATION OF COLLEGE STUDENTS. U. S. Off. Educ. Federal Security Agency, Pamphlet 98. 1945. Table 2, p. 11.

[3] In the United States only 0.97 percent of the college students were in the 14 to 15 year age group and 14.07 percent were in the 16 to 17 year age group. If it is desired to take these age groups into account, the same estimation procedure outlined below may be used as a linear adjustment of the estimates based upon the 18 to 24 age group to allow for college students of other ages.

(1) *Type I* counties as those with the urban portion of the county population included entirely within cities of 50,000 or more; (2) *Type II* counties as those whose population is entirely rural; (3) *Type III* counties as those that contain both urban and rural population but do not include a city of 50,000 inhabitants or more.[4]

Procedures for estimating the number of college students for counties of each type follow. The numerical illustration of these procedures, which begin on page 57, may help the reader follow through the successive steps.

TYPE I COUNTIES.—The number of college students (ages 18-24) from each urban area of 50,000 or more is taken directly from the 1940 Census, table 17, volume IV. The total number in the county is taken from table 21, volume II. From this is subtracted the total number of persons (ages 18-24) from urban areas of 50,000 or more in the county that were attending school (table 17, volume IV). The remainder is the number of persons attending school from the rural areas of the county.

The ratio of these rural (farm and nonfarm) persons attending college to all students is assumed to be the same as the State ratio of students attending college to students attending all schools. Applying this ratio to the number of persons attending school from the rural areas of the county will give the number of persons attending college.

TYPE II COUNTIES.—The ratio applied to the rural areas of *type I* counties is applied to the total number of persons attending school in *type II* counties to estimate the number of persons attending college from these counties.

TYPE III COUNTIES.—The State totals for urban areas of all students and of students attending college (all ages 18-24) are taken from table 17, volume IV. From these totals is subtracted the number of all students and students attending college from urban areas of 50,000 or more. These give the State totals of all students and college students from urban areas in *type III* counties.

State totals for rural areas of all students and of students attending college are also taken from table 17, volume IV. From these totals are subtracted the numbers of all students and students attending college from rural areas of *type I* counties and from *type II* counties. The remainders are the total numbers of all students and students attending college and rural areas of *type III* counties.

Adding the totals of all students from urban and rural areas and the totals of college students from rural and urban areas obtained above gives the total numbers of all students and the total numbers of all students attending college from all *type III* counties in the State. The ratio of the total of college students to the total of all students is applied to the total number of students (ages 18-24) attending school from each *type III* county to ascertain the number of college students from each county. This again assumes that the ratio for each county is the same as the State ratio.

One way to estimate the rural-urban breakdown of college students from *type III* counties is to apply to the total number of college students from each county the statewide ratio of urban college students to total college students from all *type III* counties. The total number of college students from all *type III* counties is obtained by adding the total number of urban college students to the total number of rural college students for *type III* counties. Ordinarily, this does not give very good estimates, as it assumes a uniform rural-urban composition of such counties throughout the State, whereas actually this composition varies considerably.

A more defensible procedure is to allocate the county totals on the basis of the rural-urban proportions in the total population of the county

[4] Not included in these groups are special cases, such as Arlington County, Va., which were classified as urban under special rules in 1940, even though no incorporated city of 2,500 or more existed in the county, or Denver and Denver County, Colo., which are coextensive. If the population of these areas is entirely urban and exceeds 50,000, the estimation procedure is the same as that for type I counties. If the population is entirely urban, but is less than 50,000, they will be treated like the type II counties, using the ratio of college students to all students for the urban areas of the State. If the urban population of a county is included in cities of 50,000 or more *and* in cities of 2,500 to 50,000, the first step of the procedure is the same as for type I counties. The successive steps for estimating the remaining urban students and the rural students are the same as for estimating the number of college students from the type III counties.

in 1940.[5] The Bruyère method of iteration is used to adjust the number of persons in each classification in each county to the marginal totals of total rural and total urban students in all *type III* counties.[6]

As outlined in the example of this procedure, column totals are county totals and row totals show the number of urban and rural student residents from the *type III* counties. Cell numbers are the number of student residents from urban or rural areas of a county as estimated by the percentage of urban residents reported by the census. The advantage of this method, even though it is a little longer and more difficult, is that the estimate probably follows the distribution of students more accurately county for county than does the assumption that all counties are the same. It would overcome the disadvantage of allocating too few students to rural areas of primarily rural counties and too many to rural areas of primarily urban counties.

Adjusting 1940 Census Data

The estimated number of college students obtained above is then subtracted from the population figures from the 1940 Census reports to provide a population figure excluding college students for rural, urban, and total areas of each county. The second step in the adjustment procedure is to add to the urban and rural areas of the respective counties the number of students registered in colleges in these respective areas during the spring semester or quarter of the school year 1939-1940. This enrollment figure may be obtained from each college; it includes all students, residents of the State, residents from other States, residents from outlying possessions of the United States, and residents of foreign countries. Another source of college enrollment is the 1939-40 Educational Directory of the United States Office of Education. The resulting estimate is the adjusted 1940 population figure for the particular geographic subdivision and area desired.

Application of Procedure

To illustrate this procedure adjustments for Nebraska are outlined and applied to the counties in Economic Area 7 of the State. The number of all persons age 18 to 24 attending school and the number of persons age 18 to 24 attending school who have completed the fourth year of high school or higher (persons attending college) are given in table 2. The numbers are taken directly from table 17, volume IV, 16th Census of Population, 1940.

The total number of persons attending school from Lincoln and Omaha is subtracted from the number of persons attending school from Lancaster and Douglas Counties, respectively (Table 21, volume II, 16th Census of Population, 1940). The rest are assigned to the rural areas of the two counties. In Douglas County there are 5,144 persons from 18 to 24 attending school; deducting those attending school in Omaha gives 345 persons attending school from the rural-nonfarm and rural-farm parts of the county. Similar figures for Lancaster County are 3,248 persons attending school in the county and 279 persons attending school from the rural non-farm and rural-farm areas of the county.

The ratio of persons attending college to all persons attending school, age groups of 18 to 24, in the rural areas of Nebraska is the ratio of 6,710 to 11,188, or 59.97 percent. This allocative ratio is multiplied by the total number of persons attending school in all counties that

TABLE 2—*Persons 18 to 24 attending school and persons 18 to 24 attending college, Nebraska, 1940*

	Persons attending school	Persons attending college
	Number	*Number*
State total	23,158	15,276
Urban	11,970	8,566
Rural nonfarm and rural farm	11,188	6,710
Lincoln	2,969	2,442
Omaha	4,799	2,558

[5] UNITED STATES BUREAU OF THE CENSUS. 1950 CENSUS OF POPULATION, VOLUME II, Table 5.

[6] DEMING, W. EDWARDS. STATISTICAL ADJUSTMENT OF DATA. New York, John Wiley and Sons, Inc., 1943. pp. 124-127.

have no urban population and the rural residents of Lancaster and Douglas Counties. In Nebraska these *type II* counties and the rural areas of *type I* counties contain 6,566 persons attending school, and use of the allocative ratio estimated that 3,939 of these were attending college.

The rest of the students in the State resided in *type III* counties. The number of persons attending school in these counties is 8,824 and the number of persons attending college is 6,337. The number of persons attending school and the number of persons attending college already estimated in their respective counties are given in table 3.

The number of persons attending school, urban and rural residents, remaining in the *type III* counties and the number of persons attending college are shown in table 3. These are obtained by subtracting the numbers of urban residents from *type I* counties from the numbers in urban areas in table 2 and the numbers allocated to *type II* counties from the numbers in rural areas in table 2. The ratio of the number of persons attending college in the *type III* counties (6,337) to the number of persons attending school (8,824) is 71.82. This ratio is multiplied by the number of persons attending college from the county. The proportion of these persons to be allocated to the rural and urban areas of the county is determined by the ratios of the number of urban residents (3,566) attending college and the number of rural residents (2,771) attending college, to the total persons (6,337) attending college from *type III* counties. These ratios are 56.27 percent urban and 43.73 percent rural; they allocate the students equally in all counties. This allocation, applied to *type III* counties in area 7, is shown in table 9.

To illustrate the procedure of allocating student residents to rural and urban areas, utilizing known information about the proportion of urban persons in the county, the Bruyère method is applied to all *type III* counties in Economic Area 7 in Nebraska. The number of college students from each county is shown in table 4 with the percentage of urban population in each county.

The number of student residents from all urban areas is 536, and from all rural areas it is 628. Totals must be allocated to the respective areas of the counties; restrictions are the known border totals. Allocation of residents by percentage of the urban population reported in the 1940 Census of Population is shown in table 5.

In table 5 $m_{i.}$ is the known total of urban or rural student residents from all counties. The $n_{i.}$ are the totals obtained by allocating the number of students residing in the county to the two areas by the proportion of urban persons in the county. The $n_{.j}$ and $m_{.j}$ are the column totals; they are equal as n_{ij} (number allocated to each cell) is determined by the $m_{.j}$.

The first step in the method is to multiply each n_{ij} by the ratio of $\frac{m_{i.}}{n_{i.}}$ and form a new

TABLE 3.—*Persons attending school and persons attending college, by types of counties, Nebraska, 1940*

	Persons attending school	Persons attending college
	Number	*Number*
Urban students		
Type I counties	7,768	5,000
Rural students		
Type I & II counties	6,566	3,939
Type III counties		
Urban areas	4,202	3,566
Rural areas	4,622	2,771
Total areas	8,824	6,337
Ratio of total college students to all students.		71.82%

TABLE 4.—*Number of college students and percentage urban population is of the total population by* type III *counties, Economic Area 7, Nebraska, 1940*

Counties	Students	Percentage urban population
	Number	*Percent*
Cass	172	25.1
Gage	277	36.8
Nemaha	149	28.5
Otoe	169	38.6
Richardson	214	32.0
Saunders	183	14.8
Total	1164	

table (table 6). The second step is to form the column total $m'_{.j}$; subtract it from the known column total $m_{.j}$ and enter it as a "vertical discrepancy" along the top of a new table (table 7).

In the same way form the resulting horizontal discrepancies, $m_{i.}-m'_{i.}$. Next complete the table of corrections based upon the vertical discrepancies. Distribute anyone of these discrepancies among the cells in that column in the

TABLE 5.—*Allocation of student residents, by percentage of urban and rural population, by* type III *counties, Economic Area 7, Nebraska, 1940*

	Counties						Total	
	Cass 1	Gage 2	Nemaha 3	Otoe 4	Richardson 5	Saunders 6	$n_{i.}$	$m_{i.}$
	No.	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*
1. Urban	43	102	42	65	68	27	337	536
2. Rural	129	175	107	104	146	156	827	628
Total								
$n_{.j}$	172	277	149	169	214	183	n = 1164	
$m_{.j}$	172	277	149	169	214	183		

TABLE 6.—*Iterative adjustment of allocation of student residents, by urban and rural areas, by* type III *counties, Economic Area 7, Nebraska, 1940*

	Counties						Total	
	Cass i = 1	Gage 2	Nemaha 3	Otoe 4	Richardson 5	Saunders 6	$m'_{i.}$	$m_{i.}$
	No.	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*
i = 1 Urban	68	162	67	103	108	43	551	536
2 Rural	98	133	81	79	111	118	620	628
Total								
$m'_{.j}$	166	295	148	182	219	161	1171	
$m_{.j}$	172	277	149	169	214	183		1164

TABLE 7.—*Table of corrections based on iterative adjustment of allocation of student residents, by urban and rural areas, by* type III *counties, Economic Area 7, Nebraska, 1940*

		Counties						Row Sums	Horizontal discrepancies
	i =	Cass 1	Gage 2	Nemaha 3	Otoe 4	Richardson 5	Saunders 6		
	$m'_{.j}-m_{.j}$ =	6	−18	1	−13	−5	22		
	$\frac{m_{i.}}{n}$	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	$m'_{i.}-m_{i.}$
i = 1	.46048	2(3)	−12(−8)	−1	−8(−6)	−4(−2)	8(10)	−15(−3)	−15
2	.53952	4(3)	−6(−10)	2(0)	−5(−7)	−1(−3)	14(12)	8(−4)	8
Column Sums		6	−18	1	−13	−5	22	−7	−7

TABLE 8.—*Corrected allocation of student residents by urban and rural areas, by* type III *counties, Economic Area 7, Nebraska, 1940*

	Counties						Totals	
	Cass	Gage	Nemaha	Otoe	Richardson	Saunders	$m''_{i\cdot}$	$m_{i\cdot}$
	No.	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*
Urban	70	150	66	95	104	51	536	536
Rural	102	127	83	74	110	132	628	628
Totals								
$m''_{\cdot j}$	172	277	149	169	214	183	$n = 1164$	
$m_{\cdot j}$	172	277	149	169	214	183		

proportion that the row totals are to the total number of individuals, $\frac{m_{i\cdot}}{n}$. These corrections must now be forced to equal the columnar discrepancies exactly. This is shown in table 7 where the correction that has been changed is placed in parentheses and the altered value is placed alongside. The sum of the forced corrections must also equal the horizontal or row discrepancies.

These forced corrections are added to the corresponding frequency in table 5. The result is table 8, which contains the numbers of student residents from each area of the county

TABLE 9.—*Comparison of two methods of allocating college student residents to rural and urban areas in* type III *counties, Economic Area 7, Nebraska, 1940*

	Method 1		Method 2	
	Rural	Urban	Rural	Urban
	No.	*No.*	*No.*	*No.*
Cass	75	97	102	70
Gage	121	156	127	150
Nemaha	65	84	83	66
Otoe	74	95	74	95
Richardson	94	120	110	104
Saunders	80	103	132	51

TABLE 10.—*Estimation procedure of college student residents and number of persons enrolled in college, counties, Economic Area 7, Nebraska, 1940*

Counties	Total school students	Lincoln and Omaha school students	Rural school students	Estimated rural college students	Estimated urban college students	Estimated total college students	College enrollment spring 1939-40
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
Cass [1]	239			102	70	172	
Douglas [2]	5,144	4,799	345	209	2,558	2,765	2,146
Gage [1]	386			127	150	277	
Johnson	109			65		65	
Lancaster [2]	3,248	2,969	279	167	2,442	2,609	7,402
Nemaha [1]	207			83	66	149	485[3]
Otoe [1]	235			74	95	169	
Pawnee	127			76		76	
Richardson [1]	298			110	104	214	
Sarpy	127			76		76	
Saunders [1]	256			132	51	183	99
Total				1,221	5,536	6,755	

[1] *Type III* counties. [2] *Type II* counties. [3] College located in rural area of county.

that are to be used in adjusting the 1940 census data. Comparison of the two methods applied to the type III counties of Economic Area 7 are shown in table 9.

Table 10 presents the detailed statistics for the counties in Economic Area 7 in Nebraska to illustrate the results of the estimation procedure outlined above, using the second procedure for allocating to rural and urban areas the *type III* students.

The estimated number of persons attending college from each county is subtracted from the reported 1940 population for that county, and the number of persons enrolled in the colleges located in each county are added to the population for that county to obtain an adjusted 1940 population. This procedure is illustrated in table 11, for Economic Area 7 in Nebraska, using the estimated number of college students as shown in table 4 and the number of persons enrolled in college for the second semester, 1939-40, as reported by officials from each school.

Examples of the error introduced into the migration estimates are shown in the estimates for Lincoln, rural Nemaha County, and Box Butte County (Table 12).

Net immigration is usually overestimated in all areas in which colleges are located and it is usually underestimated in areas that have no

TABLE 11.—*Adjustment of 1940 population by counties, urban, rural and total, Economic Area 7, Nebraska, 1940*

County	1940 population	College students with parental home in the county subtracted	College students attending school in county added	Adjusted 1940 population
Total	*Number*	*Number*	*Number*	*Number*
Cass	16,992	172		16,820
Douglas	247,562	2,765	2,146	246,943
Gage	29,588	277		29,311
Johnson	8,662	65		8,597
Lancaster	100,585	2,609	7,402	105,378
Nemaha	12,781	149	485	13,117
Otoe	18,994	169		18,825
Pawnee	8,514	76		8,438
Richardson	19,178	214		18,964
Sarpy	10,835	76		10,759
Saunders	17,892	183	99	17,808
Urban				
Cass	4,268	70		4,198
Douglas	223,844	2,558	2,146	223,432
Gage	10,883	150		10,733
Lancaster	81,984	2,442	7,402	86,944
Nemaha	3,639	66		3,573
Otoe	7,339	95		7,244
Richardson	6,146	103		6,043
Saunders	2,648	52	99	2,095
Rural				
Cass	12,724	102		12,622
Douglas	23,718	207		23,511
Gage	18,705	127		18,578
Johnson	8,662	65		8,597
Lancaster	18,601	167		18,434
Nemaha	9,142	83	485	9,544
Otoe	11,655	74		11,581
Pawnee	8,514	76		8,438
Richardson	13,032	111		12,921
Sarpy	10,835	76		10,759
Saunders	15,244	131		15,113

TABLE 12.—*Comparative net migration estimates for Lincoln, Rural Nemaha County and Box Butte County, Nebraska, 1940-50*

	City of Lincoln	Rural Nemaha County	Box Butte County
	Number	*Number*	*Number*
Without Adjustment			
1940 population	81,984	12,781	10,736
1950 population	98,884	10,973	12,279
Net gain or loss in population	16,900	−1,818	1,543
Natural increase	9,944	982	1,630
Net migration	6,956	−2,790	−87
With Adjustment			
1940 population	81,984	12,781	10,736
Less estimated number of college student residents	2,558	65	162
Plus students registered in local colleges	7,402	485	0
Adjusted 1940 population	86,828	13,201	10,574
1950 population	98,884	10,973	12,279
Net gain or loss in population	12,056	−2,228	1,705
Natural increase	9,944	982	1,630
Net migration	2,112	−3,210	75

colleges. The error is much greater in college areas than in others; a greater proportion of the total population is transferred to an area, such as a county, from a large number of areas by the change in enumeration.

The 1940 census data that comprise the major basis for this adjustment are subject to criticism. In 1940 a single question was asked on the highest grade of school completed. To this question respondents frequently reported the year or grade in which they were enrolled, or had last been enrolled, instead of the one completed. Thus it is possible that in 1940 the number of persons that would be estimated as attending college in the age groups might be overestimated, as persons attending the 12th year of school would report that they had completed that grade since they were so near completion.[7]

[7] UNITED STATES BUREAU OF THE CENSUS. 1950 U. S. CENSUS OF POPULATION. VOL. II, PART 27, NEBRASKA, pp. XX-XXI.

Selected Recent Research Publications in Agricultural Economics Issued by the Agricultural Marketing Service and Cooperatively by the State Colleges [1]

BITTING, H. W. PURCHASES OF FROZEN AND CANNED FOODS BY URBAN FAMILIES AS RELATED TO HOME REFRIGERATION FACILITIES. U. S. Dept. Agr. Mktg. Res. Rpt. 60, 14 pp., illus. February 1954. (RMA contract rpt.)

Lists numbers of families buying frozen foods and discusses the extent of purchases. Discusses purchases of canned and frozen foods; effect of income on purchases of such foods; and regional differences in purchases of these foods.

BOTTS, RALPH R. FARM MUTUAL REINSURANCE. U. S. Dept. Agr. Agr. Inform. Bull. 119, 56 pp. December 1953.

Farm mutual reinsurance programs are operating at the State level in only 13 States.

CARR, D. W., and HOWELL, L. D. ECONOMICS OF PREPARING WOOL FOR MARKET AND MANUFACTURE. U. S. Dept. Agr. Tech. Bull. 1078, 88 pp., illus. November 1953. (RMA)

Discusses the possibilities of strengthening the competitive position of domestic wool through improvements in preparation and marketing.

CRECINK, JOHN C., and BICE, S. AVERY. MAKING A LEASE FOR AN IRRIGATED FARM. Colo. Agr. Expt. Sta. Bull. 431-A, 43 pp., illus. October 1953. (BAE cooperating.)

How to make a good rental arrangement for an irrigated farm is shown in detail in this bulletin.

ELLIS, HAROLD, BARLOWE, RALEIGH, and HILL, E. B. INHERITANCE OF FARM PROPERTY IN MICHIGAN. Mich. Agr. Expt. Sta. Spec. Bull. 388, 30 pp., December 1953. (BAE cooperating.)

[1] Processed reports are indicated as such. All others are printed. State publications may be obtained from the issuing agencies of the respective States.

The advantages of proper farm property transfer arrangements are stressed. Michigan laws that relate to the inheritance of farm property, by descent and by will, are described.

FOOTE, RICHARD J., and FOX, KARL A. ANALYTICAL TOOLS FOR MEASURING DEMAND. U. S. Dept. Agr. Agr. Handbook 64, 86 pp., illus. January 1954.

This handbook is designed to acquaint research workers in agricultural economics and related subjects with some of the recent developments in the field.

GRAY, ROGER W., SORENSON, VERNON L., and COCHRANE, WILLARD W. PRICE SUPPORTS AND THE POTATO INDUSTRY. Minn. Agr. Expt. Sta. Bull. 424, 31 pp., illus. January 1954 (North Central Regional Pub. 43; Agr. Expt. Stas. of Ill., Ind., Ia., Kans., Mich., Minn., Mo., Nebr., N. Dak., Ohio, and Wis.; BAE and PMA cooperating.) (RMA)

Discusses the recent price-support experience with potatoes.

HASSLER, JAMES B. PRICING EFFICIENCY IN THE MANUFACTURED DAIRY PRODUCTS INDUSTRY. Hilgardia 22 (8): 235-334., illus. August 1953. (RMA)

This study, published by the California Agricultural Experiment Station and carried on under the Western Regional Dairy Marketing Project, is concerned with the price results of the United States dairy products industry from the plant level to the wholesale level.

HOGLUND, C. R. HIGH QUALITY ROUGHAGE REDUCES DAIRY COSTS. Mich. Agr. Expt. Sta. Spec. Bull. 390, 28 pp., illus., February 1954. (ARS cooperating.)

The cost of feed used in producing 100 pounds of milk can be reduced by as much as 20 to 25 percent on the average Michigan dairy farm by improving the quality of roughage, then by feeding more roughage and less protein and grain.

HUTCHINS, WELLS A., SELBY, H. E., and VOELKER, STANLEY W. IRRIGATION-ENTERPRISE ORGANIZATIONS. U. S. Dept. Agr. Cir. 934, 107 pp. October 1953. (Prepared under a cooperative agreement between SCS and BAE.)

Discusses the advantages and disadvantages of each type of organization in the development and operation of irrigation projects and also the influence of the various provisions of pertinent Federal and State laws on the solution of problems that arise in managing such enterprises.

JOHNSON, JACK D. LIVESTOCK MARKETING IN THE SOUTHERN REGION. Southern Coop. Ser. Bull. 26, 102 pp., illus. July 1952. (RMA; Agr. Expt. Stas. of Ala., Ark., Ga., La., Miss., N. C., S. C., Tenn., Va., W. Va.; BAE and PMA, USDA; and Tenn. Valley Authority cooperating.)

Contains information on marketing practices of producers gathered in a regionwide survey.

MCKAIN, WALTER C., JR., BALDWIN, ELMER D., and DUCOFF, LOUIS J. OLD AGE AND RETIREMENT IN RURAL CONNECTICUT. 2. ECONOMIC SECURITY OF FARM OPERATORS AND FARM LABORERS. Conn. Agr. Expt. Sta. Bull. 299, 51 pp. June 1953. (BAE cooperating.)

About half of the farm operators believe that they will have enough income to live fairly comfortably in their old age. The rest are not sure that they will be able to meet their needs as they grow older. Only a few of the hired laborers believe that they can support themselves in their later years.

MEINKEN, KENNETH W. THE DEMAND AND PRICE STRUCTURE FOR OATS, BARLEY, AND SORGHUM GRAINS. U. S. Dept. Agr. Tech. Bull. 1080, illus. September 1953.

Prices of these three grains and of corn are closely correlated—the three can be used interchangeably in most livestock feeding. Prices of all are determined mainly by supplies of feed available, numbers of animals to be fed, and prices of livestock and livestock products. Demand for oats and barley is inelastic.

MOTHERAL, JOE R., and BOWLES, GLADYS K. EMPLOYMENT REDISTRIBUTION OF KOREAN VETERANS. U. S. Dept Agr. Agr. Inform. Bull. 120, 25 pp. January 1954.

Of the approximately 1,900,000 Korean veterans, 10 percent were in agriculture prior to their period of service. But from the time they entered service until the time of the survey, the occupational trend was strongly away from agriculture—in June 1953, 5 percent were employed in agriculture.

PETERSON, H. B., NELSON, L. B., and PASCHAL, J. L. A REVIEW OF PHOSPHATE FERTILIZER INVESTIGATIONS IN 15 WESTERN STATES THROUGH 1949. U. S. Dept. Agr. Cir. 927, 68 pp., illus. October 1953. (BPISAE and BAE cooperating.)

Crops throughout the West vary greatly in their response to phosphate fertilizers. The composition and quality of crops are frequently affected by phosphate—both the phosphorus composition and the protein content of some crops may be changed.

REESE, ROBERT B. METHODS USED IN COMPUTING RAIL FREIGHT-RATE INDEXES FOR FARM PRODUCTS. 45 pp. Bur. Agr. Econ. October 1953. (Processed.)

The annual rail freight-rate index numbers for wheat, cotton, fresh fruits and vegetables, livestock and meats, and the combined index for farm commodities published by the Agricultural Marketing Service (formerly by the Bureau of Agricultural Economics) are now based upon postwar traffic conditions and reported on a calendar-year basis. Thus comparability is provided with

the transportation bill, the indexes of prices received by farmers, and other series published by the Agricultural Marketing Service.

SEWELL, WILLIAM H., RAMSEY, CHARLES E., and DUCOFF, LOUIS J. FARMERS CONCEPTIONS AND PLANS FOR ECONOMIC SECURITY IN OLD AGE. Wis. Agr. Expt. Sta. Research Bull. 182, 23 pp. September 1953. (BAE cooperating.)

Forty percent of the sample of Wisconsin farmers interviewed in this study believed that they would have enough to live on if they retired. The rest were either uncertain or were sure that they would not.

SNITZLER, JAMES R. MOVEMENTS, FREIGHT RATES AND PRICES OF POTATOES. RECENT TRENDS FOR NINE MAJOR MARKETS. 62 pp., illus. Agr. Marketing Service. November 1953. (RMA.)

Substantial shifting in specialized areas producing potatoes has occurred since 1946; truck unloads form an increasing percentage of total unloads; and railroad freight rates on potatoes for nine major markets increased 62 percent between the beginning of 1946 and June 1953.

TEMPLE, FREDERICK C. CABBAGE, SWEET PEPPERS, AND SHALLOTS: MARKETING AND RELATED PRODUCTION PRACTICES AMONG NEGRO GROWERS IN LOUISIANA, 1951-52 SEASON. 44 pp., illus. Agr. Mktg. Serv. December 1953. (RMA contract rept.) (Processed.)

Average cost of harvesting and marketing a bag of cabbage was 48 cents; average cost of marketing a hamper of peppers was 71 cents; average cost of marketing a barrel of shallots was $2.87. Possibilities for improving efficiency in harvesting and marketing are listed.

UNITED STATES AGRICULTURAL MARKETING SERVICE. MARKETING MARGINS FOR BEEF. 30 pp., illus. Washington, D. C. December 1953.

It appears that retail prices of beef have generally reflected the declining prices for live cattle in 1952 and 1953. These declining prices for cattle, especially for the lower grades, apparently were not caused primarily by a widening of marketing margins.

VAN ARSDALL, R. N., IBACH, D. B., and CLEAVER, THAYER. ECONOMIC AND FUNCTIONAL CHARACTERISTICS OF FARM DAIRY BUILDINGS. Ill. Agr. Expt. Sta. Bull. 570, 64 pp., illus. November 1953. (USDA cooperating.)

A survey of 350 dairy farms in the Illinois portion of the Chicago and St. Louis dairy areas was made to examine the economic and functional characteristics of their dairy buildings. It was found that low-cost buildings were as likely to provide good service as high-cost structures. Flexible, well-planned buildings were most useful.

WEBB, ROBERT W., and BURLEY, SAMUEL T., JR. THE CAUSTICAIRE METHOD FOR MEASURING COTTON-FIBER MATURITY AND FINENESS IMPROVEMENT AND EVALUATION. U. S. Dept. Agr. Mktg. Res. Rpt. 57, 62 pp., illus. December 1953.

The Causticaire method is unique in that only a combination of Micronaire readings for raw cotton (untreated) and the same cotton treated with sodium hydroxide (40 Tw) is required for deriving the two measures of cotton-fiber maturity and fineness.

WOOTEN, H. H. MAJOR USES OF LAND IN THE UNITED STATES. U. S. Dept. Agr. Tech. Bull. 1082, 100 pp., illus. October 1953.

Contains an account of the major agricultural land uses, a general analysis of the land use situation, and a discussion of the expected future needs for agricultural land in this country.

STATISTICAL COMPILATIONS

UNITED STATES AGRICULTURAL MARKETING SERVICE. COTTON QUALITY STATISTICS, UNITED STATES, 1952-53. U. S. Dept. Agr. Statis. Bull. 137, 64 pp., illus. January 1954.

UNITED STATES AGRICULTURAL MARKETING SERVICE. FARM POPULATION, ANNUAL ESTIMATES BY STATES, MAJOR GEOGRAPHIC DIVISIONS, AND REGIONS, 1920-50 AND FOR THE UNITED STATES, 1910-50. 28 pp. November 1953. (Processed.)

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. DAIRY STATISTICS AND RELATED SERIES. U. S. Dept. Agr. Statis. Bull. 134, 85 pp. October 1953.

UNITED STATES AGRICULTURAL MARKETING SERVICE. PRODUCTION OF MANUFACTURED DAIRY PRODUCTS. U. S. Dept. Agr. Statis. Bull. 136, 36 pp. December 1953.

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. SUPPLEMENT TO MAJOR USES OF LAND IN THE UNITED STATES. (U. S. D. A. Technical Bulletin 1082) BASIC LAND USE STATISTICS, 1950. 78 pp. September 1953.

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AGRICULTURAL ECONOMICS
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Is published quarterly by the Agricultural Marketing Service, U. S. Department of Agriculture. The printing of this publication was approved by the Director of the Bureau of the Budget, June 5, 1952.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. 20 cents a single copy, 75 cents a year, domestic, $1 foreign.